

SIX NEW SPECIES OF THE GENUS *POLYPLECTROPUS* (INSECTA, TRICHOPTERA, POLYCENTROPODIDAE) FROM CHINA

ZHONG Hua^{1*}, YANG Lian Fang^{1**}, John C. Morse²

1. Department of Entomology, Nanjing Agricultural University, Jiangsu 210095, China

2. Department of Entomology, Soils and Plant Sciences, Clemson University, Clemson, SC, 29634-0315, USA

Abstract Six closely related new species of the genus *Polyplectropus* Ulmer are described and illustrated, namely *P. truncatulus* sp. nov., from Yunnan, *P. convexus* sp. nov., from Sichuan, *P. dolabriformis* sp. nov., *P. mandibuliformis* sp. nov., *P. rectangulus* sp. nov., from Guangxi, and *Polyplectropus rostriformis* sp. nov., from Anhui. The type specimens of the new species herein are deposited in the Insect Collection of Nanjing Agricultural University.

Key words Trichoptera, *Polyplectropus*, new species, China.

Introduction

One hundred and fifty nine species of the genus *Polyplectropus* are currently known from all over the world except the West Palearctic Region, of which ninety one species occur in the Oriental Region (with 1 species in both Oriental and East Palearctic Regions), 53 in the Neotropical Region (with 2 species in both Neotropical and Nearctic Regions), 12 in the Australasian Region, 2 in the East Palearctic Region, and one in the Afrotropical Region (Wang & Yang, 1998; Malicky *et al.*, 2001; Morse, 2004). Since Ulmer described the first Chinese *Polyplectropus* species, *P. inaequalis* from Taiwan in 1927, only 10 species of *Polyplectropus* were documented from China by the end of 1998 (Ulmer, 1927; Hsu & Chen, 1996; Li & Morse, 1997; Wang & Yang, 1998). Recently, the authors examined specimens collected from The Chinese Trichoptera Fauna Expedition to Hengduan Mountain Range in 1996, Qiling Mountain Range in 1998, Guangdong and Guangxi in 2004 and Jiangxi

and Sichuan in 2005. The results of the expedition organized by Dr. John C. Morse and Prof. YANG Lian Fang indicated that the genus *Polyplectropus* has higher species diversity in China, and twenty eight species of the genus were identified. In the present paper, six closely related new species of the genus are described, and the rest of species will be described successively in other papers. The type specimens of the new species herein are deposited in the Insect Collection of Nanjing Agricultural University. Terms for male genitalia and wing venation are from Li and Morse (1997).

Polyplectropus Ulmer

Polyplectropus Ulmer, 1905: 103. Type species: *Polyplectropus flavicornis* Ulmer, monotype.

Diagnosis. Venation (Fig. 1). Forewings each with Forks 1, 2, 3, 4, and 5 and with the discoidal cell (DC) and median cell (MC) closed. Hind wings each with Forks 2 and 5 and with DC and MC open.

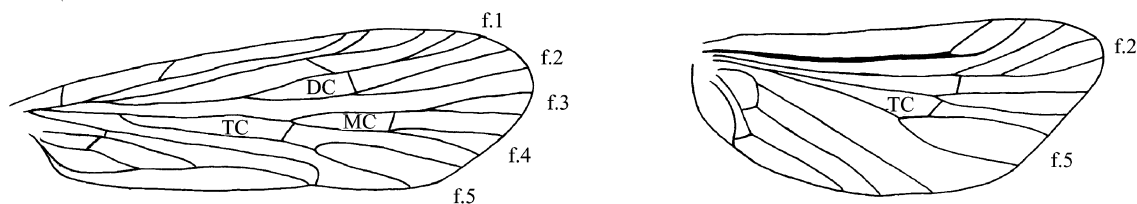


Fig. 1. *Polyplectropus mandibuliformis* sp. nov. Right forewing and hind wing, dorsal. DC= discoidal cell; f. 1= Fork 1; f. 2= Fork 2; f. 3= Fork 3; f. 4= Fork 4; f. 5= Fork 5; MC= median cell; TC= thyridial cell.

1 *Polyplectropus truncatulus* sp. nov. (Figs. 2-7)

Adult. Length of forewing 5.6–6.2 mm ($n = 4$).

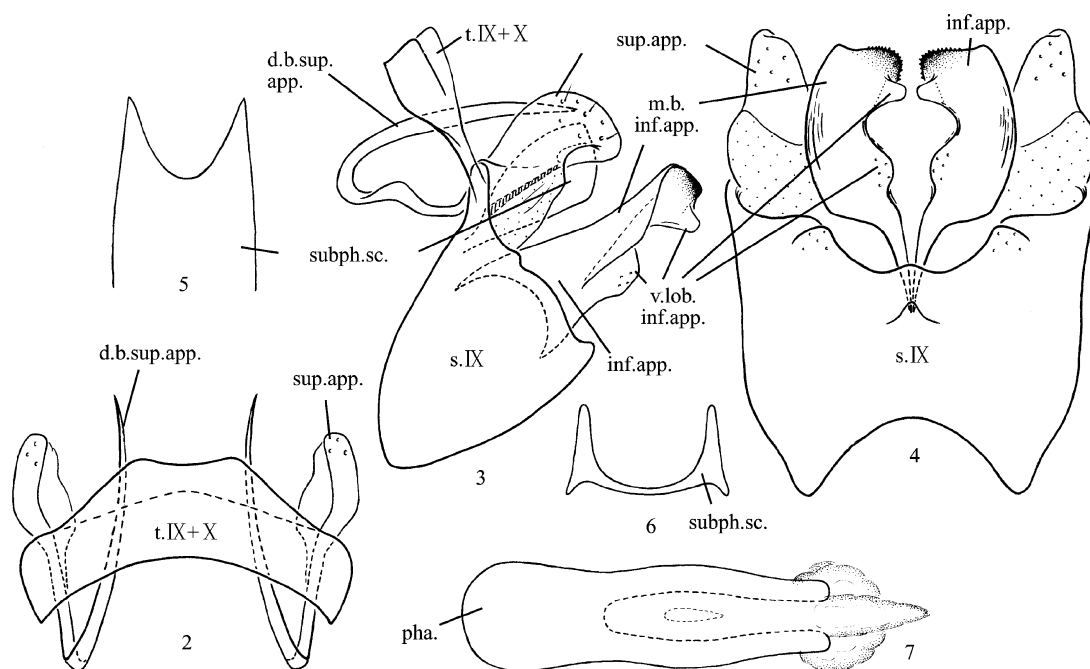
Head brown, antennae and pronotum sordid

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* Graduate student, the Department of Entomology, Nanjing Agricultural University.

** Corresponding author, E mail: lfyang@njau.edu.cn

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Figs 2-7. Adult male genitalia of *Polyplectropus truncatulus* sp. nov. 2. Dorsal view. 3. Lateral view. 4. Ventral view. 5. Subphallic sclerite, ventral view. 6. Subphallic sclerite, caudal view. 7. Phallus, dorsal view. d. b. sup. app. = dorsobasal process of superior appendage; inf. app. = inferior appendage; m. b. inf. app. = main body of inferior appendage; pha. = phallus; s. IX = sternum IX; subph. sc. = subphallic sclerite; sup. app. = superior appendage; t. IX+X = tergum IX+X; v. lob. inf. app. = ventrolateral lobe of inferior appendage.

yellowish, meso and metanotum brown, forewings brown.

Male genitalia. Posterior margin of sternum IX with broad excision and a triangular, mesal protrusion. Tergum IX+X short, sub-trapezoid in dorsal view. Superior appendage sub-oval, narrowed basally, approximately 1.5 times as long as apical width. Dorsobasal process of superior appendage not enlarged at base, recurved at the 1/3 distance from its base in lateral view. Inferior appendage approximately 2 times as long as its basal width, its apex truncated in lateral view; basal portion of ventrolateral lobe (= ventral branch, Li and Morse, 1997) setose, semicircular, and apical portion small, cylindrical, flap shaped; in ventral view, inner margin of the appendage with semicircular excision. Subphallic sclerite with lateral margins strongly protruded in vertical direction, such that distal margin much broader than its base in lateral view (Fig. 3). Phallus simple tube, about 4 times as long as its average width.

Holotype ♂, Yunnan Province, Xuanweishi (26.13° N, 104.06° E), Yangliuxiang, Tachuashanzhuang, alt. 1600 m, 16 June 1998, coll. GUI Furong. **Paratype:** 4 ♂♂, 1 ♀, same data as holotype; 1 ♂, Yunnan Province, Dalishi (25.42° N,

100.10° E), Zhonghecun, alt. 2150 m, 22 May 1996, coll. YANG Liang Fang.

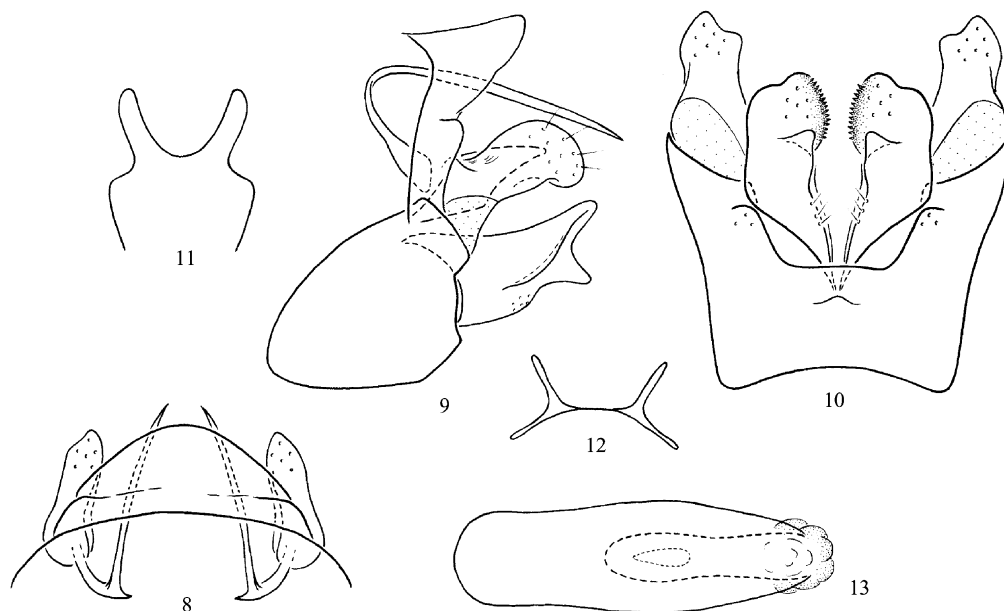
Diagnosis. This species is very similar to *Polyplectropus alkyone* Malicky and Chantaramongkol, 1997, from Thailand, in the general shape of the male genitalia, especially in the shape of the inferior appendage. However, the new species differs from it in: 1) superior appendage narrowed basally, approximately 1.5 times as long as its apical width in lateral view (slender with rounded apex, 3 times as long as its apical width in *P. alkyone*); 2) the apex of the dorsobasal process of superior appendage is straight in lateral view (hook-shaped in *P. alkyone*); 3) the inner margin of inferior appendage has a semicircular excision in ventral view (it is broadly concave with no excision in *P. alkyone*).

Etymology. The species name is the Latin adjective *truncatulus* (diminutive form of the past participle of *truncare*) to indicate the shape of the end of inferior appendage in lateral view.

Distribution. Yunnan (Xuanwei, Dali).

2 *Polyplectropus convexus* sp. nov. (Figs. 8-13)

Adult. Length of fore wing 4.7 mm ($n = 1$). Head brown with yellowish antennae, pronotum sordid yellow, meso and metanotum brown, forewings



Figs 8-13. Adult male genitalia of *Polyplectropus convexus* sp. nov. 8. Dorsal view. 9. Lateral view. 10. Ventral view. 11. Subphallic sclerite, ventral view. 12. Subphallic sclerite, caudal view. 13. Phallus, dorsal view.

grayish brown sparsely scattered with small, white dots.

Male genitalia. Posterior margin of sternum IX with trapezoidal excision. Tergum IX+ X triangular with rounded posterior margin. Superior appendage suboval, approximately 2 times as long as its apical width. Dorsobasal process of superior appendage triangular basally, basal 1/3 erect, distal 2/3 obliquely curved backward. Inferior appendage approximately 2 times as long as its basal width in lateral view, with dorsal margin straight and lateral margin slightly expanded lateroventrad, bilobed apex forming a wide "V"; in ventral view, apex of the appendage with both inner and outer angles rounded, inner apical angle longer than outer apical angle and covered with tiny teeth; ventral lobe seen as triangular flap 1/3 distance from apex of appendage. Subphallic sclerite trough-like, with apex forked as in Fig. 11. Phallus simple tube, about 3 times as long as its average width.

Holotype ♂, Sichuan Province, Meigu County (28.76° N, 103.25° E), Meigu Dafengding National Nature Preserve, Shuwoxiang Village, Chachakou Stream, alt. 1650 m, 6 July 2005, coll. Christy Jo Geraci, John Chapman Morse. **Paratype** 1 ♂, Sichuan Province, Meigu County (28.76° N, 103.25° E), Meigu Dafengding National Nature Preserve, Shuwoxiang Village, Gongfanyi Stream, alt. 1653 m, 6 July 2005, coll. ZHOU Xin.

Diagnosis. This species is very similar to *Polyplectropus truncatulus* sp. nov. from Yunnan.

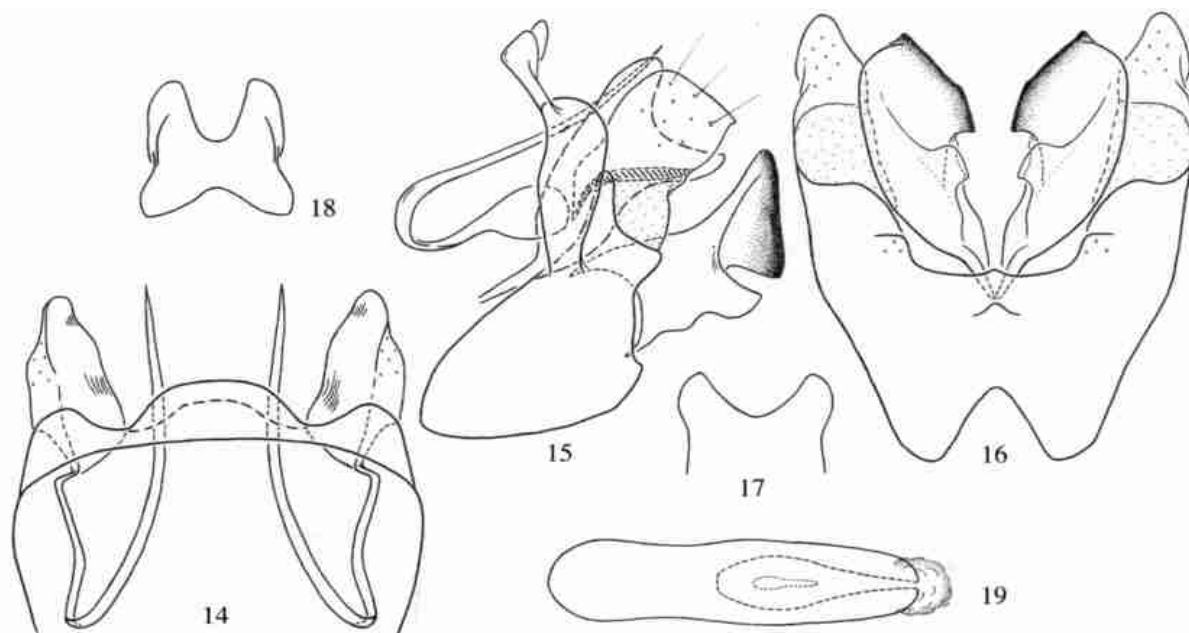
However, the new species differs from it in 1) the inferior appendage do not extend beyond the superior appendage (the inferior appendage extend beyond the superior appendage in *P. truncatulus*); 2) in ventral view, the inner apical angle of inferior appendage is much longer than the outer one (the inferior appendage are truncate in *P. truncatulus*); 3) the ventral lobe of inferior appendage is not well developed basally, its apical part is represented as a triangular flap 1/3 distance from the apex of the appendage (this is a semicircular basal lobe and a small, semicircular flap 1/4 distance from the apex of the appendage in *P. truncatulus*); 4) the dorsobasal process of superior appendage is broader and triangular basally, with its basal 1/3 straight and erect (the basal portion of this process is sinuate in *P. truncatulus*); and 5) the apex of subphallic sclerite narrowed and forked as in Fig. 11 (with with U-shaped apicomeral excision as in Fig. 5).

Etymology. The species name is the Latin adjective *convexus* (= vaulted, arched, or convex) to indicate the shape of the protruding apical inner angles of the inferior appendage.

Distribution. Sichuan.

3 *Polyplectropus dolabriformis* sp. nov. (Figs. 14-19)

Adult. Length of fore wing 6.3-6.5 mm ($n=2$). Head light brown with yellowish antennae, pronotum yellow, meso- and metanotum dark brown, forewings grayish brown.



Figs. 14-19. Adult male genitalia of *Polyplectropus dolabriformis* sp. nov. 14. Dorsal view. 15. Lateral view. 16. Ventral view. 17. Subphallic sclerite, ventral view. 18. Subphallic sclerite, caudal view. 19. Phallus, dorsal view.

Male genitalia. Posterior margin of sternum IX with broad trapezoidal excision. Tergum IX+X small trapezoid. Superior appendage arising midlaterally from IX, with its basal portion mostly membranous except with sclerotized strip connecting with quadrate, highly sclerotized distal portion in lateral view; in dorsal view, inner surface of appendage strongly convex. Dorsobasal process of superior appendage with broad suboval base in lateral view, directed horizontally anterad in basal 1/3 and then recurved caudad. Inferior appendage approximately 2 times as long as its basal width in lateral view, with apex darkened and ax-shaped, ventrolateral lobe highly developed and broad distally in ventral view. Subphallic sclerite well developed and divided apically in lateral view, butterfly shaped in caudal view. Phallus simple tube, about 4 times as long as its average width.

Holotype ♂, Guangxi Province, Tianlin County (24.3° N, 106.2° E), Mt. Cenwanglao Provincial Forest Preserve, Yaoshan Gou, tributary of Buliu River, alt. 1 223 m, 9 June 2004, coll. YANG Liang-Fang and Christy Jo Geraci. Paratype: 1 ♀, same data as holotype; 1 ♂, 1 ♀, Guangxi Province, Tianlin County (24.3° N, 106.2° E), Mt. Cenwanglao Provincial Forest Preserve, unnamed tributary of headwaters of Buliu River, alt. 1 422 m, 8 June 2004, coll. YANG Liang-Fang and Christy Jo Geraci.

Diagnosis. This species is very similar to *Polyplectropus chin* Malicky, 1995, from Vietnam, in the general shape of the male genitalia, especially in

the convex and highly sclerotized apex of inferior appendage in ventral view and the highly developed ventral ridge of inferior appendage, with its broad, rectangular distal lobe. However, the new species differs from it in: 1) superior appendage is approximately 2 times as long as its average width in lateral view (3 times as long as average width in same view in *P. chin*); 2) the apex of inferior appendage is ax-shaped (narrow, subrounded in *P. chin*); 3) the subphallic sclerite is divided apically in lateral view, with its distal end almost reaching the apices of the inferior appendages (only with a small apico-mesal notch and reaching the middle of the inferior appendages in *P. chin*).

Etymology. The species name is a Latin adjective, *dolabriformis* (= ax-shaped or hatchet-shaped), indicating the appearance of the apex of the inferior appendage.

Distribution. Guangxi.

4 *Polyplectropus mandibuliformis* sp. nov. (Figs. 20-25)

Adult. Length of fore wing 5.8-6.0 mm ($n=2$). Antennae sordid yellow, head and thorax dark brown, forewings grayish brown.

Male genitalia. Posterior margin of sternum IX with broadly rounded excision and small median protrusion. Tergum IX+X semioval. Superior appendage long, finger-like, approximately 6.5 times as long as its width. Dorsobasal process of superior

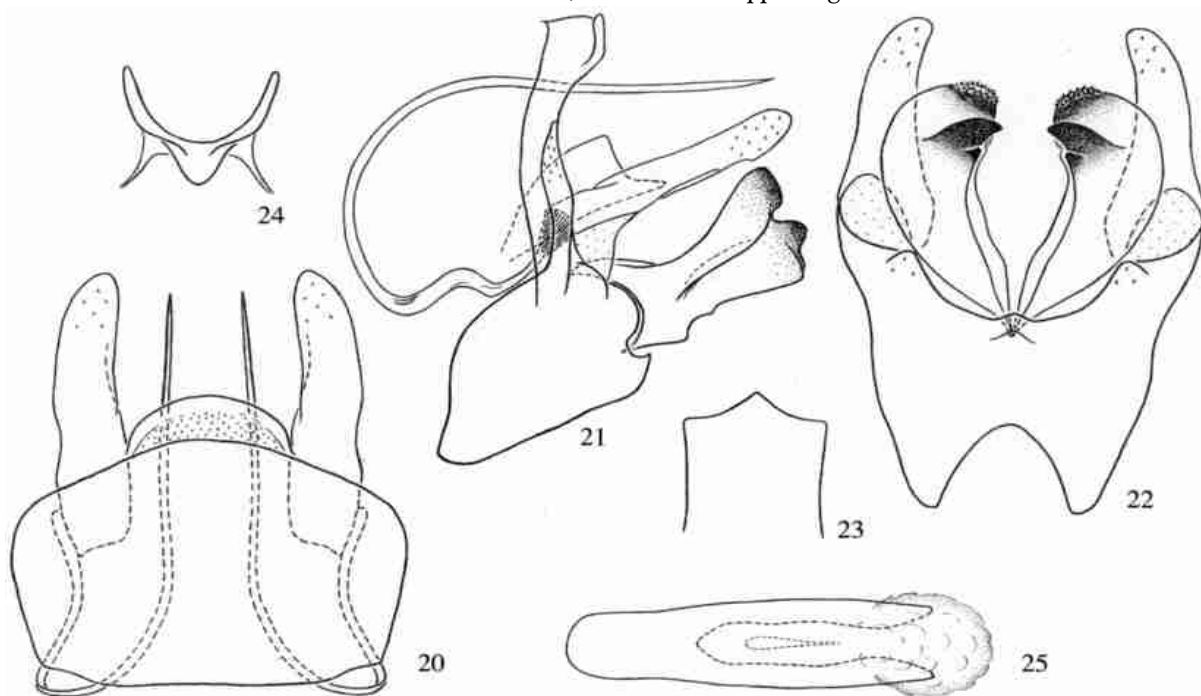
appendage evenly slender, not enlarged basally, sinuous in basal 1/4 and then arching high above superior appendage, distal 1/3 nearly straight. Inferior appendage narrowed at middle in lateral view, with apex highly sclerotized and bilobed; its lateral margin slightly expanded lateroventrally; apex rounded in ventral view, darkened and densely covered with tiny teeth, its ventrolateral lobe positioned 2/3 distance from base of appendage, mandible like, with small basal tooth. Subphallic sclerite deeply trough-like, its apex with triangular protrusion in ventral view (Fig 23). Phallus simple tube, about 4 times as long as its average width.

Holotype ♂, Guangxi Province, Shangsi County (21.9° N, 107.9° E), Mt. Shiwanda National Forest Park, Shitou River, 1.35 km SW of main entrance to Park, alt. 300 m, 5 June 2004, coll. YANG Lian-fang and Christy Jo Geraci. Paratypes: 1 ♂, 1 ♀, Guangxi Province, Shangsi County (21.9° N, 107.9° E), Mt. Shiwanda National Forest Park,

Zhujiangyuan Waterfall, 1st tributary of Shitou River, 4 km SW of main entrance to Park, alt. 485 m, 6 June 2004, coll. ZHOU Xin and Karl Kjer.

Diagnosis. This species is very similar to *Polyplectropus chin* Malicky, 1995, from Vietnam, in the general shape of the male genitalia. However, this species differs from the latter in: 1) the dorsobasal process of superior appendage arches high above the appendage, curving about 90 degrees in its middle 1/3, becoming nearly straight in its distal 1/3 (recurved gradually about 60 degrees in the distal 2/3 in *P. chin*); 2) the apex of inferior appendage is rounded (triangular in *P. chin*); 3) the ventrolateral lobe of inferior appendage is mandible-like and with a small basomesal tooth (generally a parallelogram and without a basomesal tooth in *P. chin*).

Etymology. The species name is a Latin adjective, *mandibuliformis* (= mandible-shaped), indicating the ventral appearance of the ventrolateral lobe of the inferior appendage.



Figs 20-25. Adult male genitalia of *Polyplectropus mandibuliformis* sp. nov. 20. Dorsal view. 21. Lateral view. 22. Ventral view. 23. Subphallic sclerite, ventral view. 24. Subphallic sclerite, caudal view. 25. Phallus, dorsal view.

Distribution. Guangxi.

5 *Polyplectropus rectangulus* sp. nov. (Figs. 26-31)

Adult. Length of fore wing 6.1-6.2 mm ($n = 2$). Head dark brown with yellowish antennae, pronotum light brown, meso and metathorax dark brown, forewings grayish brown.

Male genitalia. Posterior margin of sternum IX

with broadly rounded excision and small median protrusion. Tergum IX+X trapezoid, with posterior margin curved dorsad. Superior appendage strongly narrowed basally, with apex obliquely truncate, approximately 2.5 times as long as its apical width. Dorsobasal process of superior appendage enlarged basally in right triangular plate in dorsal view, its basal half extending anterad and then dorsad in right

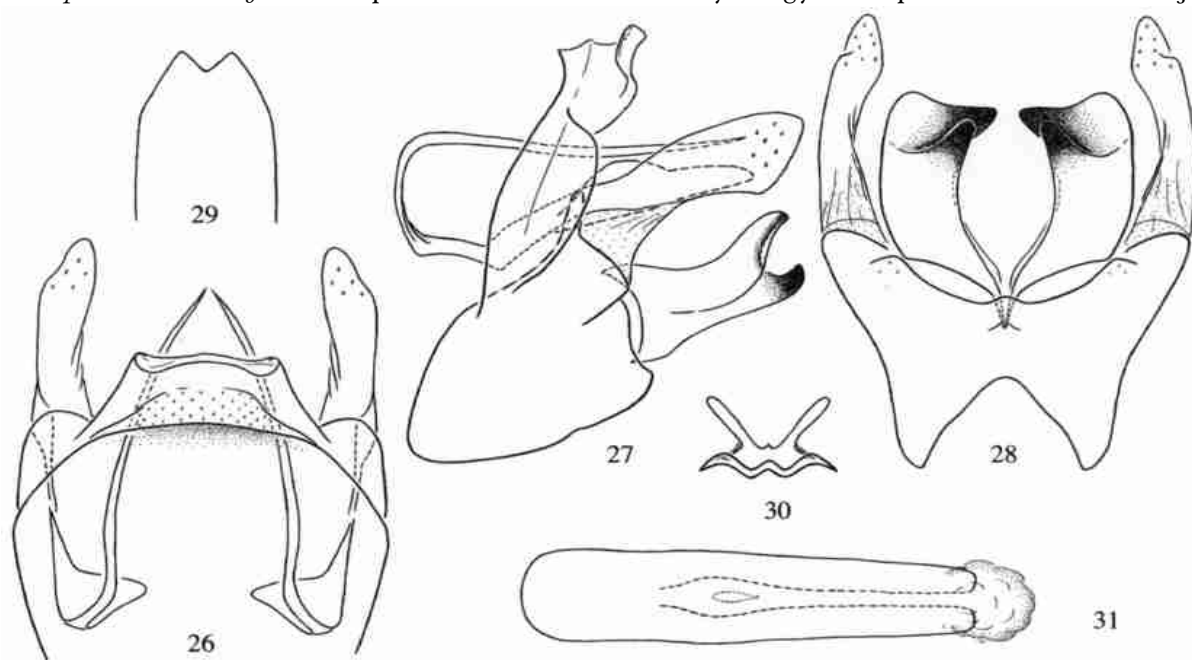
angle, its distal half nearly straight and directed caudad. Inferior appendage narrowed at middle, approximately 2 times as long as its basal width in lateral view, with apex almost identically bilobed and darkly sclerotized, resembling immovable chela; lateral margin slightly expanded; in ventral view, apex of inferior appendage triangular, horizontal and directed mesad; ventrolateral lobe finger-like, located at 1/3 distance from apex of appendage. Subphallic sclerite deeply trough-like, its apex with a small V-shape excision in ventral view. Phallus simple tube, about 4.5 times as long as its average width.

Holotype ♂, Guangxi Province, Huajiang County (25.8°N, 110.5°E), Mt. Jiuwanda Provincial Nature Preserve, unnamed tributary of Yangmeiauxi, alt. 1148 m, 15 June 2004, coll. YANG Lianfang. Paratype 1 ♂, same data as holotype.

Diagnosis. This species is very similar to *Polyplectropus mandibuliformis* sp. nov. from

Guangxi, in the general shape of the male genitalia. However, this species differs from the latter in: 1) the superior appendage in lateral view is slender basally and resembling a handle, with its apex obliquely truncate, approximately 2.5 times as long as its apical width (long and finger-like, apically blunt, approximately 6.5 times as long as its apical width in *P. mandibuliformis*); 2) the basal half of the dorsobasal process of superior appendage is rectangular (arched high over superior appendage in *P. mandibuliformis*); 3) inferior appendage with outer apical angle rounded, inner angle triangular and with hairs only (apex of inferior appendage blunt laterally and round mesally, densely covered with tiny teeth in *P. mandibuliformis*); and 4) the ventrolateral lobe of inferior appendage is thumb-like and without teeth (mandible-like and with a small basomesal tooth in *P. mandibuliformis*).

Etymology. The species name is a Latin adjective,



Figs 26-31. Adult male genitalia of *Polyplectropus rectangulus* sp. nov. 26. Dorsal view. 27. Lateral view. 28. Ventral view. 29. Subphallic sclerite, ventral view. 30. Subphallic sclerite, caudal view. 31. Phallus, dorsal view.

rectangulus (= right-angled), indicating the basal half of the dorsobasal process of superior appendage extending anterad in a rectangle.

Distribution. Guangxi.

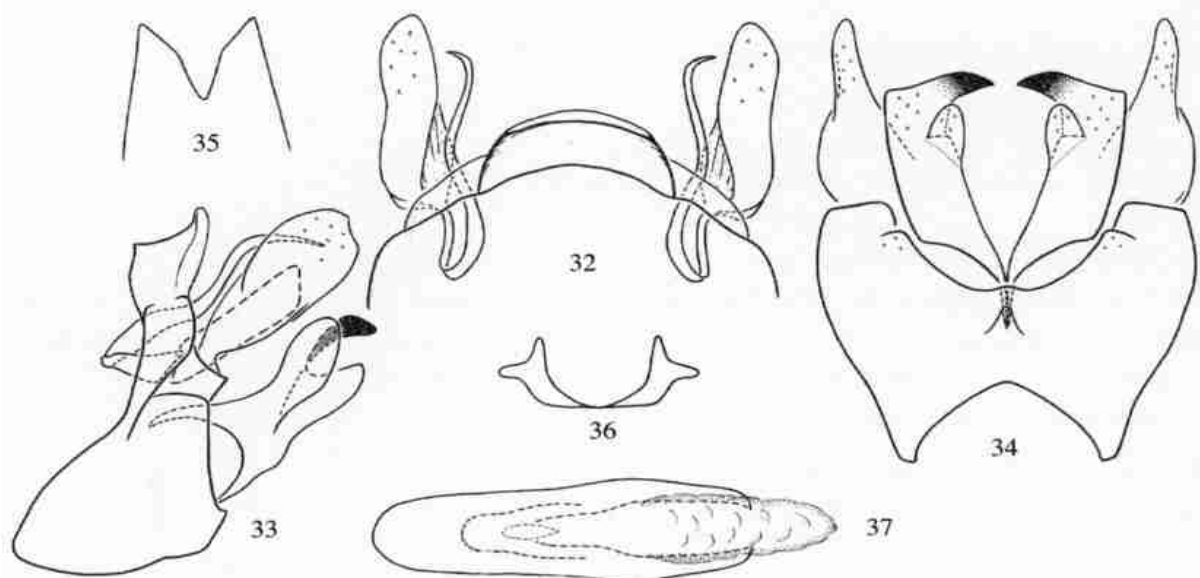
6 *Polyplectropus rostriformis* sp. nov. (Figs. 32-37)

Adult. Length of fore wing 4.7 mm ($n = 1$). Head brown with yellowish antennae, pronotum yellowish, meso and metathorax brown, forewings brown.

Male genitalia. Posterior margin of sternum IX with semicircular excision and small median protrusion. Tergum IX+X semi oval with posterior margin slightly curved upward. Superior appendage long, strongly narrowed basally, approximately 3 times as long as its median width. Dorsobasal process of superior appendage with broad subtriangular plate basally in lateral view, sinuate, hooked at apex. Inferior appendage narrowed at middle, its distal half bifoliate, with apex reaching mid length of superior

appendage, and with lateral margin strongly expanded lateroventrally; in ventral view apicomesal end of inferior appendage beak-like and highly sclerotized, ventrolateral lobe oval, located subapically. Subphallic sclerite with V-shaped apicomesal excision and with outer lateral edges strongly projecting and acute in caudal view (figs. 36). Phallus simple tube, about 3.5 times as long as its average width.

Holotype ♂, Anhui Province, Qimen County (29.8° N, 117.7° E), Lixi, 450 m downstream of Shuanghekou, 28 Sep. 2003, coll. SHAN Lin Na and SUN Chang Hai.



Figs 32-37. Adult male genitalia of *Polyplectropus rostriformis* sp. nov. 32. Dorsal view. 33. Lateral view. 34. Ventral view. 35. Subphallic sclerite, ventral view. 36. Subphallic sclerite, caudal view. 37. Phallus, dorsal view.

Etymology. The species name is a Latin adjective, *rostriformis* (= beak-shaped), indicating the appearance of the apicomesal end of inferior appendage.

Distribution. Anhui.

Relationship discussion

These 6 new species are closely related in sharing 1) a highly developed ventrolateral lobe of inferior appendage, 2) a subphallic sclerite that is deep and trough-like, with lateral margins strongly protruding as vertical plates. Apparently, *Polyplectropus parangulari* Wang & Yang, 1998 (Zhejiang), *Polyplectropus chin* Malicky, 1995 (Vietnam), *Polyplectropus tam* Malicky, 1995 (Vietnam), *Polyplectropus josaphat* Malicky, 1993 (Malaysia) and *Polyplectropus simei* Malicky, 1993 (Brunei) also share these characters, which suggests that these 11 species could be included in a monophyletic species group. The species groups for the genus will be further

Diagnosis. This species is very similar to *Polyplectropus rectangulus* sp. nov. from Guangxi, in the strongly expanded lateral edge of the inferior appendage. However, this species differs from it in: 1) the sinuate shape and hooked apex of the dorsobasal process of superior appendage (straight and with apex not hooked in *P. rectangulus*); 2) apicomesal end of inferior appendage beak-like, ventrolateral lobe oval (apicomesal end triangular, ventrolateral lobe finger-like in *P. rectangulus*); and 3) the subphallic sclerite being deeply excised in a "V" shape (with only a shallow triangular excision in *P. rectangulus*).

studied in the future.

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中国缺又多距石蛾属六新种记述 (毛翅目, 多距石蛾科)

钟 花¹ 杨莲芳¹ John C. Morse²

1. 南京农业大学昆虫学系 南京 210095, E-mail: lfyang@njau.edu.cn
2. 美国克莱姆森大学昆虫, 土壤和植物科学系 克莱姆森 南卡罗来纳州 29634-0315

摘 要 研究了中国毛翅目多距石蛾科缺又多距石蛾属种类, 并报道了其中亲缘关系较近的 6 新种, 即端截缺又多距石蛾 *Polyplectropus truncatulus* sp. nov., 端突缺又多距石蛾 *Polyplectropus convexus* sp. nov., 斧端缺又多距石蛾 *Polyplectropus dolabriformis* sp. nov., 颚状缺又多距石蛾

Polyplectropus mandibuliformis sp. nov., 距枝缺又多距石蛾 *Polyplectropus rectangulus* sp. nov., 喙端缺又多距石蛾 *Polyplectropus rostriformis* sp. nov.。新种模式标本保存在南京农业大学昆虫标本馆。

关键词 毛翅目, 缺又多距石蛾属, 新种, 中国.

中图分类号 Q969.411.4